

ABSTRACT

A number of thermal elements are used in a microfluidic device to move or manipulate nano-liter and pico-liter amounts of adsorbed fluid analytes and reagents on the device surface. All of the basic microfluidic operations of transport, merge, subdivide, separate, sort, remove, and capture are provided. A typical device embodiment has a flat or curved surface with the thermal elements located at or near the surface and arranged in any of a number of patterns that make possible specific manipulations of the adsorbed fluids on the surface. The thermal elements may be electrical resistive heaters or Peltier Effect junctions, and are activated by a series of electrical pulses from a control means. The heated or cooled thermal elements produce localized thermal gradients in the surface which in turn induce a surface tension gradient between the adsorbed fluid and the surface, making possible a variety of fluid manipulations on the surface.